

Schorlemmer (C.), F.R.S. *Der Ursprung und die Entwicklung der Organischen Chemie.* 8vo. *Braunschweig* 1889. The Author.

Vernon-Harcourt (L. F.) *Some Canal, River, and other Works in France, Belgium, and Germany.* 8vo. *London* 1889.

The Author.

Williamson (B.), F.R.S., and F. A. Tarleton. *An Elementary Treatise on Dynamics.* 2nd Edition. 8vo. *London* 1889.

The Authors.

Medallion Portrait of Mr. John Evans, Treas. R.S. Mr. Evans.  
Eleven mounted Photographs of Nebulæ, &c.

Mr. Isaac Roberts, F.R.A.S.

*November 21, 1889.*

Sir G. GABRIEL STOKES, Bart., D.C.L., President, in the Chair.

The Right Hon. Arthur James Balfour (elected January 12, 1888), Lieut.-General Sir William F. D. Jervois (elected 1888), and Mr. Rowland Trimen (elected 1883) were admitted into the Society.

In pursuance of the Statutes, notice of the ensuing Anniversary Meeting was given from the Chair, and the list of Officers and Council nominated for election was read as follows:—

*President.*—Sir George Gabriel Stokes, Bart., M.A., D.C.L., LL.D.

*Treasurer.*—John Evans, D.C.L., LL.D.

*Secretaries.*—{ Professor Michael Foster, M.A., M.D.  
{ The Lord Rayleigh, M.A., D.C.L.

*Foreign Secretary.*—Archibald Geikie, LL.D.

*Other Members of the Council.*—Professor Henry Edward Armstrong, Ph.D.; Professor William Edward Ayrton; Charles Baron Clarke, M.A.; Professor W. Boyd Dawkins, M.A.; Edward Emanuel Klein, M.D.; Professor E. Ray Lankester, M.A.; Hugo Müller, Ph.D.; Professor Alfred Newton, M.A.; Captain Andrew Noble, C.B.; Rev. Stephen Joseph Perry, D.Sc.; Sir Henry E. Roscoe, D.C.L.; Edward John Routh, D.Sc.; William Scovell Savory; Professor Joseph John Thomson, M.A.; Professor Alexander William Williamson, LL.D.; Sir Charles William Wilson, Col. R.E.

Colonel Clarke, Sir James Cockle, Mr. F. Galton, Dr. Geikie, and Dr. Rae were by ballot elected Auditors of the Treasurer's accounts on the part of the Society.

The Presents received were laid on the table and thanks ordered for them.

The following Papers were read:—

- I. "Further Discussion of the Sun-spot Observations made at South Kensington. A Report to the Solar Physics Committee." Communicated to the Royal Society at the request of the Committee. By J. NORMAN LOCKYER, F.R.S. Received June 27, 1889.

I have previously reported the results of 700 observations of Sun-spot spectra,\* extending from November, 1879, to August, 1885. The observations have been carried on continuously since the latter date, but, in consequence of the small number of spots which have been visible, the number of additional observations is only a little over 150. Last year very few observations could be made. The eighth hundred of observations dates from August, 1885, to August, 1887, and the first half of the ninth hundred from August, 1887, to February, 1888.

As on former occasions, I give Tables A, B, C, showing the numbers of lines of iron, nickel, and titanium respectively which have been recorded amongst the most widened. Table D shows the results in the case of the lines which may at present be described as "unknown lines."

\* 'Roy. Soc. Proc.,' vol. 40, p. 347.



[illegible]Region *b*—D.

5861	2								
5790	2								
5761	9								
5730	5								
5710	8								
5677	9								
5623	4								
5614	5								
5591	2								
5577	4								
5583	7								
5545	5								
5542	0								
5531	6								
5505	9								
5500	5								
5496	6								
5489	0								

5473·2		1ST HUNDRED.
5454·7		12th November, 1879, to
5445·9		29th September, 1880.
5444·2		2ND HUNDRED.
5428·8		29th September, 1880, to
5404·8		15th October, 1881.
5403·1		3RD HUNDRED.
5396·1		18th October, 1881, to
5392·2		27th June, 1882.
5390·4		4TH HUNDRED.
5388·5		1st July, 1882, to
5370·5		28th August, 1883.
5369·0		5TH HUNDRED.
5366·5		30th August, 1883, to
5364·0		23rd June, 1884.
5361·9		6TH HUNDRED.
5352·4		24th June, 1884, to
5348·6		12th February, 1885.
5340·2		7TH HUNDRED.
5339·2		18th February, 1885, to
5327·3		24th August, 1885.
5323·4		8TH HUNDRED.
5306·3		25th August, 1885, to
5287·3		2nd August, 1887.
5282·4		9TH HUNDRED (First Half).
5272·5		2nd August, 1887, to
5269·5		20th February, 1888.
5268·5		
5265·8		
5262·4		
5252·5		
5232·1		
5229·0		
5226·2		
5207·6		
5203·7		
5201·5		
5194·1		
5191·7		
5185·0		

TABLE B.—NICKEL.

Region F—*b*.

	1st hundred.	2nd hundred.	3rd hundred.	4th hundred.	5th hundred.	6th hundred.	7th hundred.	8th hundred.	9th hundred (first half).
5155·1									
5145·7	—	—	—	—				—	
5141·8	—	—	—	—				—	
5136·8	—	—	—	—				—	
5098·5		—	—	—				—	
5080·6		—	—	—		—		—	
5079·8			—	—				—	
5034·6	—	—		—				—	
5016·8	—	—		—				—	
4983·5	—	—		—				—	
4979·4		—		—				—	
4935·1				—				—	

TABLE C.—TITANIUM.

Region F—*b*.

5151·2		1st hundred.
5147·0		
5144·5		2nd hundred.
5119·9		
5086·5		
5064·4		3rd hundred.
5038·7		
5038·0		
5037·8		4th hundred.
5035·8		
5035·2		
5019·2		5th hundred.
5013·3		
5006·6		6th hundred.
		7th hundred.
		8th hundred.
		9th hundred (first half).



TABLE D.—UNKNOWN WIDENED LINES.

Region F—b.

	1st hundred.	2nd hundred.	3rd hundred.	4th hundred.	5th hundred.	6th hundred.	7th hundred.	8th hundred.	9th hundred (first half).
5179·4							1		
5175·0						3			
5172·2							1		
5171·1							2		
5170·0							2		
5164·0								6	
5162·2	1		23	49	21	30			
5162·0			9	7	61	67	62	47	3
5160·4		1		5			4		
5160·0			1	4		9			
5159·5	1		31	59	80	86	57	56	39
5159·0			1	8	13	11	41		1
5157·2				4					
5156·5					8				
5156·0	1	12	37	4	82	91	95	53	3
5155·4					1				
5154·0							1		
5153·8					1				
5151·8					1				
5150·0				1					
5149·8		8	2	8		8			
5149·5				4			29	12	
5149·2				1					
5149·0	2	32	31	36	4		35		
5148·8			1	2					
5148·0							1		
5146·5				2					
5146·0			36	12					
5145·5						1			
5144·5					1				
5144·2	1	3		2					
5143·2			2						
5143·0							20	3	
5142·8		21	7	19	2				
5142·2	13	4		1					
5141·5								1	1
5141·2								1	1
5140·4		2							
5139·4		1	2	3					
5139·0					1		1	1	
5138·0					1		3		
5137·8		12	35	64	13	10	3	3	
5137·5			4		72	79	22	14	
5137·0			2	2	1				
5136·5			3	1					
5136·0			4		9	22	27	2	
5135·8			37	52	13	2			
5135·5		33	15		53	36	20	21	
5135·0					16	36	11		





	1st hundred.	2nd hundred.	3rd hundred.	4th hundred.	5th hundred.	6th hundred.	7th hundred.	8th hundred.	9th hundred. (first half).
5044·6		3						2	
5043·0		1							
5042·3			4						
5042·0			3					1	
5038·9			1	1					
5037·0						1			
5034·8	11		3						
5030·0		1						4	
5028·9		1							
5020·0								1	
5017·2		1							
5009·2									1
4995·9								1	
4975·9								10	19
4971·0								2	
4959·0									5
4944·0			1						
4921·2								4	1
4910·5				2				1	
4912·5								1	
4910·5								1	
4910·0				2					
4900·3								1	
4895·9									1
4893·9									4
4891·8					1				
4888·3	1								
4885·0							1		
4865·0						1			

Region *b*—D.

5893·0							1		
5890·5							10		
5890·0							1		
5887·5				1			3		
5886·5				1	1		3		
5885·2					1				
5884·5							1		
5882·4								1	
5878·3								1	
5876·5						2			
5870·0						5			
5869·5					1				
5867·5		4		14		8	10	2	
5867·0							10		
5866·0				7	10	5	50	2	
5865·5			1	2			1		
5865·0		8	16	12	1	1	23		
5864·3						1	4		
5864·0					2		2		
5863·2		5						2	
5863·0					1		6		2



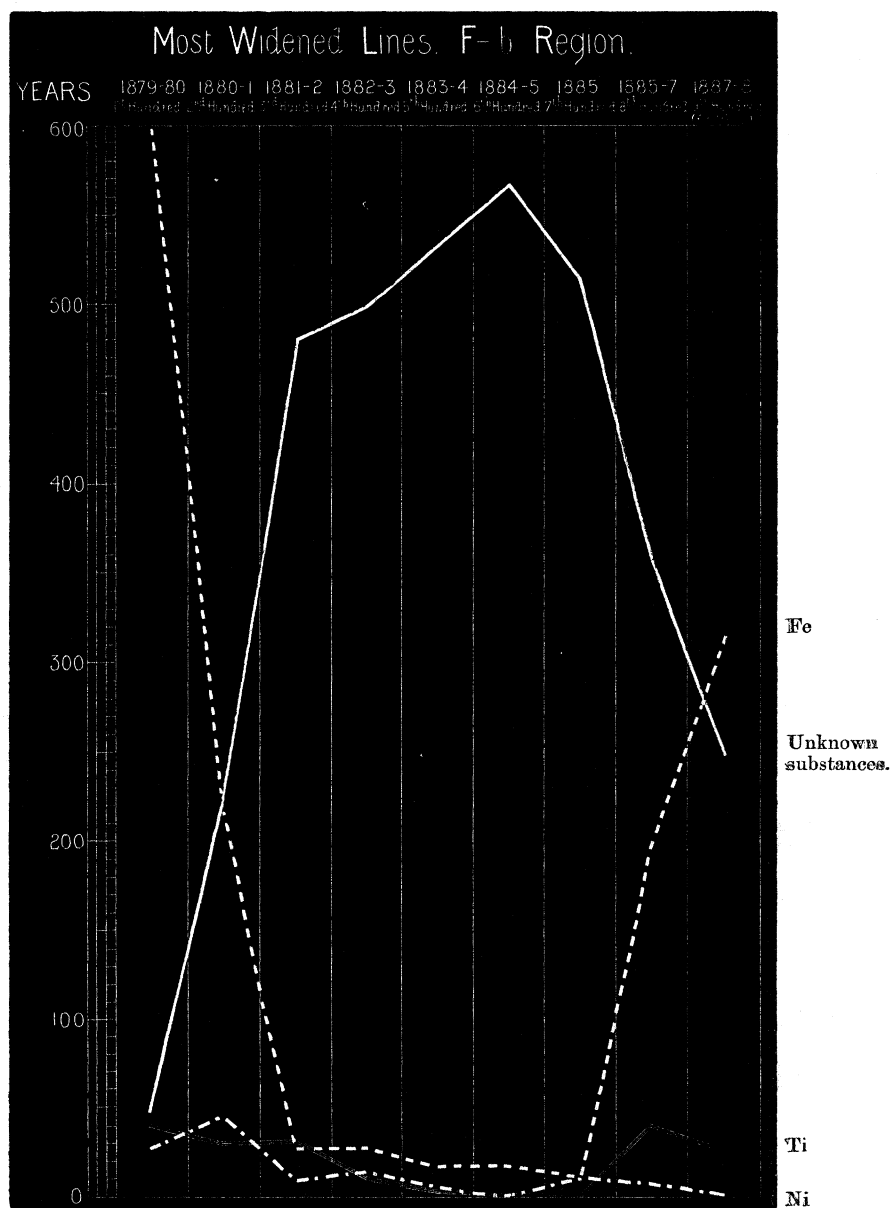
	1st hundred.	2nd hundred.	3rd hundred.	4th hundred.	5th hundred.	6th hundred.	7th hundred.	8th hundred.	9th hundred. (first half).
5738·5				2					
5736·8				1					
5736·5		18	6	49	13				
5756·0				3	9	11	2		
5735·5				3		1		2	
5735·0				1	2		11	6	
5734·5		1	1	6					
5733·0				1					
5732·0					1				
5731·8				1					
5730·0		15	55	38	83	88	73	1	
5729·5				2					
5728·0				5					
5727·5				4				1	
5726·5		13	51	25	26				
5726·0		2	7	8	60	89	72	1	
5724·0							1	1	
5723·0			2	6					
5722·5							4		
5722·0							3		
5721·5				1					
5721·3						3			
5719·0				2				2	
5718·0								1	
5706·0			1						
5703·5								14	1
5703·0				4					4
5702·5								2	
5702·0				2					
5699·0		23	1	10					
5698·5				1	1		4		
5698·0		1							
5697·0				4					
5695·0							4		
5678·0				1					
5677·5				1					
5672·5			1						
5672·0		51	56	64	61	83	32	40	38
5671·5			1	1					
5671·0		51	56	64	62	85	30	40	38
5670·5			1	3					
5670·3							3		
5670·0			1	1		1	1	3	
5669·7							3		
5669·5			2	5					
5660·0				1					
5637·5			1						
5636·2		1							
5629·5			1						
5628·0		17	1				2		
5627·5			19	3					
5627·0			2	2					
5626·7			9						

	1st hundred.	2nd hundred.	3rd hundred.	4th hundred.	5th hundred.	6th hundred.	7th hundred.	8th hundred.	9th hundred. (first half).
5626·5		1		1					
5626·0			9	4					
5622·0						1			
5621·0				1		1			
5602·0								1	
5595·2								1	
5583·5			2					1	
5572·4								1	
5567·5								1	1
5566·3				1				1	2
5559·0				1					
5558·4		1							
5541·0					1				
5538·0				1					
5537·0		2	5						
5536·8						4			
5536·5						4			
5536·2		2	5					1	
5536·0				1					
5535·5					1				
5535·0					1				
5534·2		1							
5533·8		1						1	
5532·5			1						
5532·0			1						
5529·5		3						1	
5521·0								2	
5520·4								1	
5515·5		1			1				6
5511·4		1							
5505·8					1				
5505·2					1				
5493·6		1							
5492·5		1							
5489·5			1	3					
5486·0		1							
5484·5							3	3	
5484·0								4	
5482·5								1	
5481·0		2						2	
5477·3								3	
5475·0							3		
5466·0			1						
5463·3			6					1	
5462·5				1					
5461·0		9	7	3	1		3		
5460·5								8	
5460·0		21	48	15	21	2	10	1	
5459·5		17	26	29	24	65	11	26	2
5459·0							18		
5457·0								1	
5456·0								1	
5447·0			1						

	1st hundred.	2nd hundred.	3rd hundred.	4th hundred.	5th hundred.	6th hundred.	7th hundred.	8th hundred.	9th hundred (first half).
5444.0		1							
5435.5			6					2	
5434.5			6					2	4
5431.8								3	8
5431.6			6	1					4
5428.9		1							
5428.0								1	
5427.0						1		3	
5426.2				1					
5426.0		21	52	37	51	73	45	17	
5425.3					1		3	11	
5424.5			1						
5424.0							4		
5423.7	1								
5423.5					1				
5419.5						5			
5414.5					2				
5413.2							1	1	
5412.2							1	1	
5410.0		2							
5409.2					2				
5409.0		1							
5406.4								17	6
5406.0								1	
5397.1								1	
5393.5		1					2	23	4
5372.5								5	6
5368.0								2	
5367.5								1	
5365.2								2	
5364.2		1							
5360.5								1	
5357.5					1			1	
5345.0	1							2	
5333.7								2	
5333.0								1	
5331.0				1				3	
5329.2		1							2
5328.6		1							
5328.4		1							
5327.7	14	6			1				
5327.2					1				
5321.3		7	8						1
5320.3		6	8						
5318.5						1			
5307.5		6	8						
5300.0		1						33	48
5299.0								1	
5297.5	2	4	2						
5296.2	1	1	3	1					
5296.0			1						
5281.7								2	
5277.0		1							

	1st hundred.	2nd hundred.	3rd hundred.	4th hundred.	5th hundred.	6th hundred.	7th hundred.	8th hundred.	9th hundred (first half).
5275·0	1								
5263·4	2	1							
5259·5		2	4	2		3	6	14	
5259·3							6		
5256·0			2						
5255·8							2		
5255·5								1	
5248·0								1	
5246·5			1						
5244·9									1
5240·0			1						
5238·0		1	4	2					
5237·5						4	1	1	
5236·8		1							
5227·5								4	
5227·3	1							1	
5226·5						1			
5224·8						3	4		6
5224·0			2	2	2	3			
5223·8								1	
5223·4		1							
5220·0						1			
5219·5						2			
5219·2	1	5	5						
5219·0			1					2	
5218·7	1	13	2	14					
5218·5					33	6			
5218·0			1			2	1	22	7
5217·1	2	2				1			
5216·5		2				1			
5216·2	2					1			
5215·5	2					1			
5214·5						1			
5214·3	2								
5213·0								2	
5210·0								3	
5209·2							2		
5206·5								4	
5202·5								2	
5200·5								1	
5199·6							1		
5199·4							1	1	
5193·5							1		
5191·8		1							
5190·8	16	5							
5180·9		1							
5179·4								1	
5178·0		2							
5176·0				1					
5172·2								1	
5171·5								2	
5170·5				1					
5170·1		1						2	

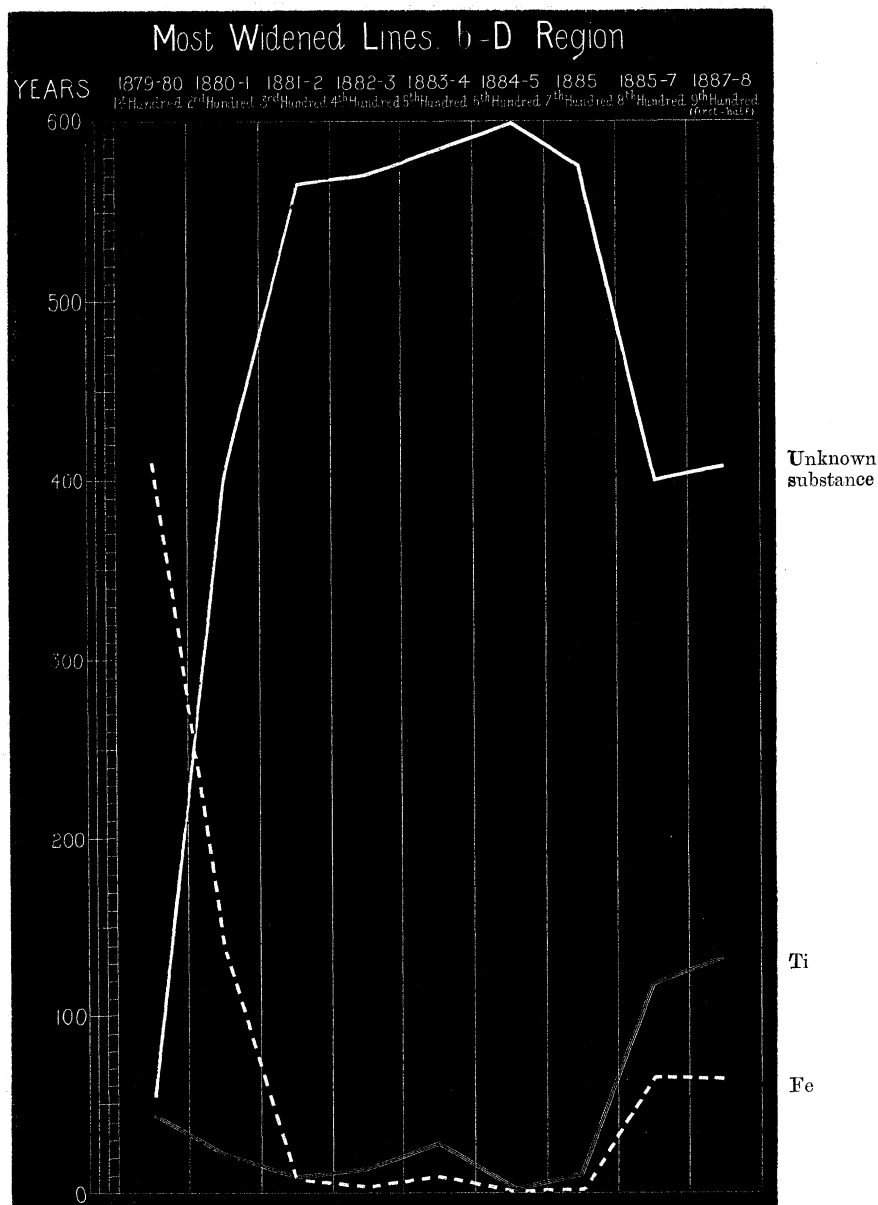
FIG. 1.



Number of appearances of known and unknown lines in the F—b region.



FIG. 2.



Number of appearances of known and unknown lines in the *b*-D region.

The relation of the present observations to former ones is shown in the accompanying diagrams (figs. 1 and 2).

[In each observation the six most widened lines in each region are recorded, so that in each 100 observations there are 600 lines in each region. The relative numbers of the lines which are due to iron, nickel, titanium, and unknown substances are graphically represented by the curves. The dotted line refers to the lines of iron, the chain line to those of nickel, the multiple line to those of titanium, and the thick continuous line to those of unknown substances.

The minimum period occurred in 1879, and the maximum at the end of 1883, so that the observations now nearly extend through a Sun-spot cycle.

It will be seen that the conclusion I arrived at in 1886,\* namely, that "as we pass from minimum to maximum, the lines of the chemical elements gradually disappear from among those most widened, their places being taken by lines of which we have at present no terrestrial representatives," is supported by the continued observations, especially in the F—b region.

The 150 observations now added were made by Messrs. Fowler and Taylor, and reduced and mapped by Messrs. Coppen and Porter.—November 1, 1889.]

## II. "On the Cause of Variability in Condensing Swarms of Meteorites." By J. NORMAN LOCKYER, F.R.S. Received June 27th, 1889.

### I. THE GENERAL THEORY.

One of the general conclusions I arrived at in my paper on "Researches on the Spectra of Meteorites"† was as follows:—"Most of the variable stars which have been observed belong to those classes of bodies which I now suggest are uncondensed meteor-swarms, or condensed stars in which a central more or less solid condensed mass exists. In some of those having regular periods the variation would seem to be partly due to swarms of meteorites moving round a bright or dark body, the maximum light occurring at periastron."

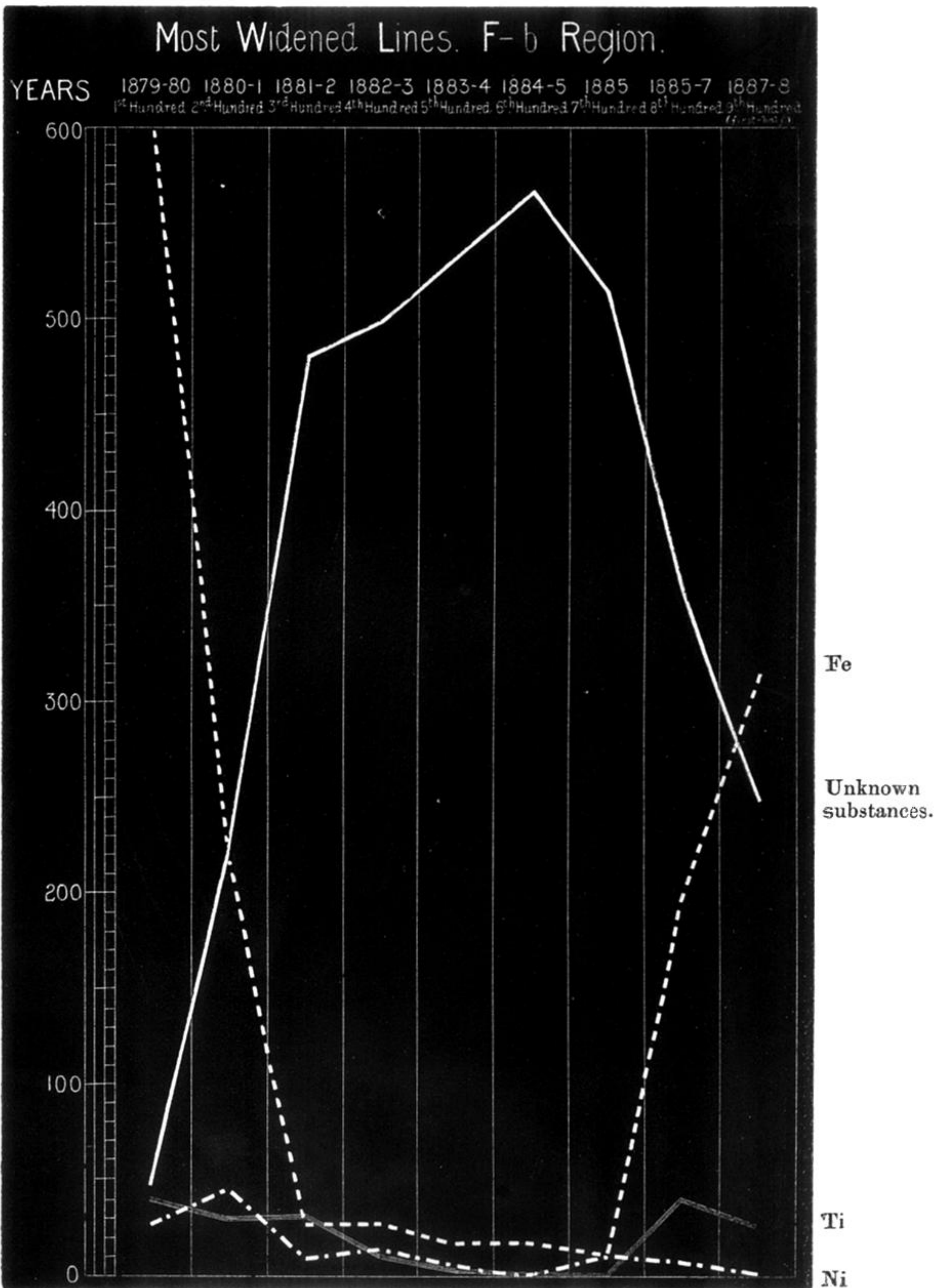
And again in 1888,‡ referring to the former class, I added, "If the views I have put forward are true, the objects now under consideration are those in the heavens which are least condensed. In this point, then, they differ essentially from all true stars like the Sun. This fundamental difference of structure should be

\* 'Roy. Soc. Proc.,' vol. 40, p. 352.

† 'Roy. Soc. Proc.,' vol. 43, p. 154.

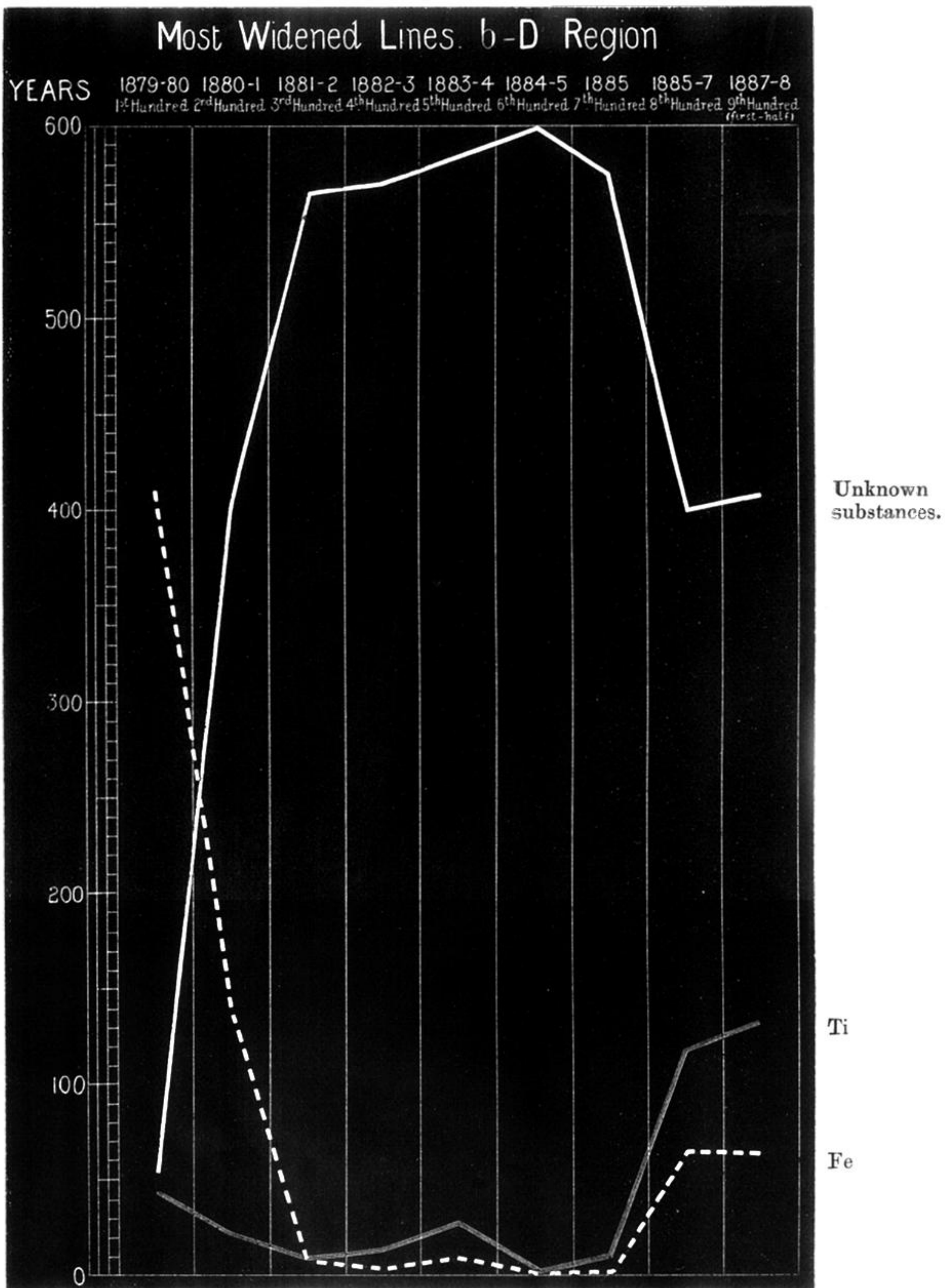
‡ 'Roy. Soc. Proc.,' vol. 44, p. 81.

FIG. 1.



Number of appearances of known and unknown lines in the F—b region.

FIG. 2.



Number of appearances of known and unknown lines in the *b*-D region.